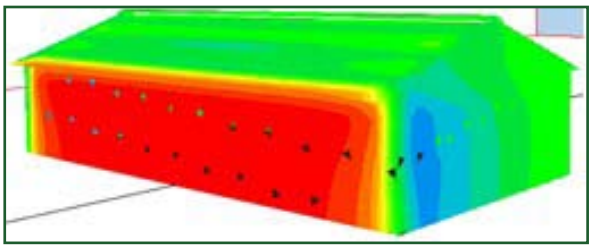
RESEARCH in Progress

Forest Products Laboratory

Forces in a Light-Frame Wood Building under Wind Loads—Preliminary Study

Forces in low-rise, light-frame buildings (LFB) due to wind loads are affected by wind velocity profile, wind direction, surrounding terrain, and the structure itself. The preliminary study uses a computational fluid dynamics (CFD) approach to model pressures on the building envelope resulting from wind velocity. The CFD model will be verified using experimental data from a subsequent study.



Pressure distribution on a building envelope calculated from a three-dimensional CFD model and used to assess uniformity of pressure coefficients for more detailed two-dimensional model

Background

Wind pressures on low-rise buildings are approximated by uniformly or linearly varying functions over the building surface. Only simple box-like structures are covered by existing standards. A lack of experimental and analytical data limits our knowledge of wind effects on LFB. CFD is a powerful tool that can be used to investigate the effects of wind load on LFB of various shapes and orientation, but existing models need to be validated.

Objective

The objective of the research is to determine expected wind loads and resulting reaction forces (roof-to-walls, walls-to-foundation) for the experimental building proposed to be erected in Florida as a part of this project. A broader objective is the development of a CFD model capable of predicting pressure distribution on the LFB envelope.

Approach

The research involves applying CFD to obtain pressures on the building envelope and merging those results with a simple two-dimensional analytical model to calculate reaction forces.

Expected Outcomes

Results will be used to demonstrate the applicability of the approach (CFD and building response) and subsequently to develop models that can be used for more complex geometries.

Timeline

The research started in September 2008 and should be completed by the end of December 2008.

Cooperators

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U.S. Forest Service, Forest Products Laboratory

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